National Aeronautics and Space Administration

*Langley Research Center's*

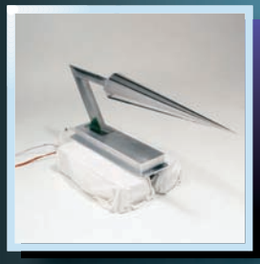
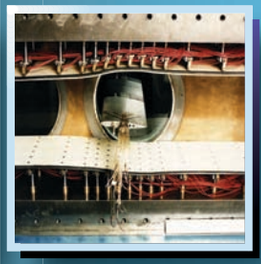
# 0.3-Meter Transonic Cryogenic Tunnel (0.3-m TCT)

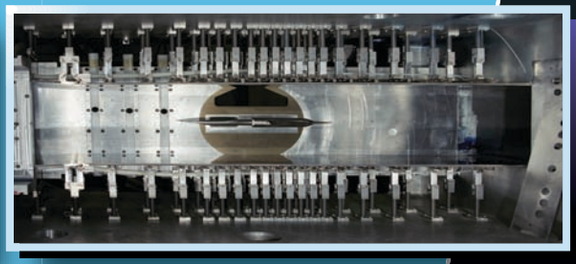
The 0.3-Meter Transonic Cryogenic Tunnel (0.3-m TCT) is a high-pressure, cryogenic, closed-circuit, wind tunnel used to test two-dimensional airfoil sections and proof-of-concept configurations, develop advanced test techniques, and validate computation fluid dynamics codes at high Reynolds numbers. The flexible floor and ceiling in the 0.3-m square test section can be adjusted to approximate free-stream shapes to eliminate or reduce wall effects.

The 0.3-m TCT is capable of running with air or gaseous nitrogen as the test medium. With the ability to control temperature and pressure as well, a very large range of Reynolds and Mach number combinations can be achieved.

The test section has computer-controlled angle-of-attack and traversing-wake-survey rake systems. Two inches of honeycomb and five anti-turbulence screens in the settling chamber provide flow quality suitable for natural laminar flow testing.

High-pressure (350 psi) and low-pressure (100 psi) air sources are available. These sources are located near the test section and can be used for boundary-layer blowing or calibration of auxiliary devices.



## Facility Benefits

- As many as 56,000 gallons of liquid nitrogen can be stored on site, providing long test times before refilling is required.
- Model turntables on both sides of the test section are equipped with clear, quartz-crystal viewing windows for photographic and video coverage of the test section. Optional pressure-instrumented or clear Lexan turntables are also available. Both video and still photographic images can be recorded.
- Schlieren, pressure and temperature sensitive paint, hot films and wires and laser-velocimeter flow visualization techniques are available.
- Advanced fabrication techniques reduce the cost of airfoil models.

## Facility Applications

- The facility has conducted two-dimensional testing projects for commercial customers, NASA and universities including supercritical and natural laminar flow airfoil development.
- Advanced NASA circulation control airfoil concepts using jets have been developed at the 0.3-m TCT.
- The facility has been used to develop advanced test techniques for cryogenic applications including pressure and temperature sensitive paints.
- Tests have been conducted in the 0.3-m TCT to measure shock-boundary layer interactions and transonic drag reduction.
- The facility has also been used for probe calibrations, studying trailing-edge effects on rotorcraft blades, conducting flow control experiments using pneumatic bumps, and studying the effects of deicing boots on airfoil performance.

## Characteristics

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|---|---|
| Test section dimensions | 13 in. high by 13 in. wide *(0.33 m high by 0.33 m wide)* |
| Speed | Mach 0.1 to 0.9 |
| Reynolds number | 1 to 100×$10^6$ per ft |
| Temperature | -280 °F to 120 °F *(-173 °C to 49 °C)* |
| Pressure | 14.7 to 88 psi *(1.03 kg/cm to 6.18 kg/cm)* |
| Test gas | Nitrogen or Air |

## Data Acquisition and Processing

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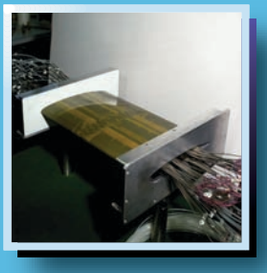
|---|---|
| Inputs | Analog and digital |
| Controller | Open Architecture Data Acquisition System (OADAS) |
| Capacity/channels | Analog/256, Digital/64 |
| Customer computers | Yes |
| Classified capability | Yes |
| Video and photography | DVD recordable |



## Instrumentation

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|---|---|
| Electronically Scanned Pressure (ESP) system | Rates up to 500 samples per sec, Modules available in 5, 15, 30, 45, and 100 psi with a total of 480 pressures, of which 192 are available for model use. |
| Wake rake | 9-probe, computer controlled sweep |

## Contact Information


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